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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/188,389	11/05/98	LEE	CS97-110/112

MM42/0104  
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EXAMINER

PERALTA, G

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 01/04/00

*4*

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

**Office Action Summary**

Application No.

09/186,388

Applicant(s)

LEE ET AL.

Examiner

Ginette Peralta

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. § 119**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).
- a) ☐ All b) ☐ Some \* c) ☐ None of the CERTIFIED copies of the priority documents have been:
1. ☐ received.
2. ☐ received in Application No. (Series Code / Serial Number) \_\_\_\_.
3. ☐ received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. & 119(e).

**Attachment(s)**

- 14) ☒ Notice of References Cited (PTO-892)
- 15) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 16) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 17) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_.
- 18) ☐ Notice of Informal Patent Application (PTO-152)
- 19) ☐ Other: \_\_\_\_\_

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## DETAILED ACTION

### ***Claim Rejections - 35 USC § 112***

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. Claim 14 recites the limitation "said phosphorus ion source" in line 1 of the claim. There is insufficient antecedent basis for this limitation in the claim.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 3, 4, 7, 8, 9, 10, 11, 15, 16, 17, 18, 21, 22, 23, 24, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. (U.S. Pat. 4,560,879) in view S. Wolf, *Silicon Processing for the VLSI Era, Volume 2: Process Integration*.

Wu et al. teaches a method and apparatus for implantation of doubly charged ions that comprises providing a semiconductor wafer and an ion implant apparatus,

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placing a phosphorus or arsenic ion source in the ion implant apparatus, adjusting the ion implant apparatus so that the ion implant apparatus produces an ion beam comprising  $P_2^+$  or  $As_2^+$  ions, wherein the ion beam has a beam density and a beam energy, and implanting  $P_2^+$  or  $As_2^+$  ions into the semiconductor wafer using the ion implant beam.

Wu et al. does not show a semiconductor wafer having source/drain regions or a polysilicon electrode and annealing the wafer having  $P_2^+$  or  $As_2^+$  ions implanted at an anneal temperature for an anneal time.

Wolf teaches in pages 332-334 a process sequence for a semiconductor integrated circuit wafer that includes implanting the source/drain regions and the polysilicon electrode with phosphorus or arsenic and annealing the integrated circuit wafer at an anneal temperature for an anneal time.

It would have been obvious to one of ordinary skill in the art to use an integrated circuit wafer containing source/drain regions or a polysilicon electrode as the semiconductor wafer of Wu et al., because Wu et al.'s process applies to any semiconductor material and it provides the means for effecting the doping of semiconductor materials in a controlled and rapid manner. Furthermore, it would have been obvious to one of ordinary skill in the art to perform a step of annealing after the implantation in order to activate the implanted ions and to position the source/drain junctions as desired.

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With respect to claims 2, 9, 16 and 23, Wu et al. teaches the ion implant apparatus using a magnetic analyzer.

With respect to claims 3, 10, 17 and 24, Wu et al. teaches in Figs. 4 to 9 beam densities of  $P_2^+$  between  $2.34 \times 10^{14}$  to  $5 \times 10^{14}$  ions/cm<sup>2</sup>. It would have been within the scope of one of ordinary skill in the art to use other beam densities as it would not yield any unexpected results and to use the same beam densities for the  $As_2^+$  as these ions are implanted at similar conditions.

With respect to claims 4, 11, 18 and 25, Wu et al. teaches that  $P_2^+$  will be supplied typically at a beam energy of 25 KeV. It would have been within the scope of one of ordinary skill in the art to vary the beam energies towards lower or higher values and to use  $As_2^+$  as it would not yield any unexpected results in the range of 20 and 48 KeV.

With respect to claims 7, 21 and 28, Wu et al. teaches a phosphorus or arsenic ion source that comprises solid phosphorus or arsenic.

3. Claims 1 to 13 and 15 to 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu et al. in view of Wolf as applied to claims 1, 2, 3, 4, 7, 8, 9, 10, 11, 15, 16, 17, 18, 21, 22, 23, 24, 25 and 28 above, and further in view of Wolf et al., *Silicon Processing for the VLSI Era, Volume 1: Process Technology*.

Wu et al. modified by Wolf, as used above, teaches the process steps but does not show the ranges of anneal temperatures and anneal time.

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Wolf et al. teaches in Pages 305-306, annealing of implanted surfaces at temperatures higher than 600°C, normally 800-1000°C, at minimum times.


Thus, it would have been within the scope of one of ordinary skill in the art to anneal at temperatures ranging between about 900°C and 1100°C, as the ranges taught by Wolf et al. can be varied without yielding any unexpected results, and using an anneal time between 10 and 20 seconds, because Wolf et al. that when a 600°C anneal is used, minutes are sufficient for the completion of the process and when annealing at higher temperatures the time should be reduced to a minimum.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ginette Peralta whose telephone number is (703)305-7722. The examiner can normally be reached on Monday to Friday 8:00 AM-4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703)306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7722 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

GP  
December 30, 1999

  
Donald L. Monin, Jr.  
Primary Examiner